What's your E2IQ?

ENERGY LEARN

FACT SHEET

Wind

Key Terms

- Kinetic Energy
- Mountain Gaps
- Wind Breaks
- Wind Farms

Wind Facts

- The highest surface wind recorded was 231 miles per hour (mph) at Mt. Washington, New Hampshire in 1934.
- At Commonwealth Bay, Antarctica, winds may gust to 200 mph.
- More than 5,000 years ago, Egyptians used wind energy to sail ships along the Nile River.
- In the United States, windmills were erected as the American West was developed during the late 19th century. Most of them were used to pump water for farms and ranches.
- The largest wind turbines have propellers that span more than the length of a football field, stand 20 stories high and produce enough electricity to power 1,400 homes.

What is wind?

Wind is simply air in motion. It is caused by the uneven heating of the earth's surface by the sun. Since the earth's surface is made up of land and water, desert and forest, the surface absorbs the sun's heat differently. During the day, the air above land heats more quickly than air above water. The warm air over land expands and rises, and the heavier, cooler air rushes in to take its place, creating winds. In the same way, the large atmospheric winds that circle the earth are created because the land near the earth's equator is heated more by the sun than land near the North and South Poles.

Today, people use wind energy to make electricity. Wind is called a renewable energy source because the wind will blow as long as the sun shines.

The History of Wind Machines

Since ancient times, people have harnessed the wind's energy. More than 5,000 years ago, the ancient Egyptians used the wind to sail ships on the Nile River. Later, people built windmills to grind wheat and other grains. The early windmills looked like paddle wheels.

Centuries later, the people in Holland improved the windmill. They gave it propeller-type blades. Holland is still famous for its windmills.

In the United States, the colonists used windmills to grind wheat and corn, to pump water and to cut wood at sawmills. Today, people occasionally use windmills to grind grain and pump water but they also use new wind machines to make electricity.

Continued on back

Wind is renewable.

As long as the sun shines, there will be winds on the earth. We will never run out of wind energy. It is a renewable energy source. It is also free, since no one can own the sun or the air.

Wind Machines Today

Like old-fashioned windmills, today's wind machines use blades to collect the wind's *kinetic energy* – energy in motion. Wind machines work because they slow the speed of the wind. The wind flows over the blades causing lift, like the effect on airplane wings, causing them to turn. The blades are connected to a drive shaft that turns an electric generator to make electricity.

The new wind machines still have the problem of what to do when the wind isn't blowing. They usually have a battery to store the extra energy they collect when the wind is blowing.

Wind Power Plants

Wind power plants, or *wind farms,* are clusters of wind machines used to produce electricity. A wind farm usually has hundreds of wind machines in all shapes and sizes.

Unlike power plants, most wind plants are not owned by public utility companies. Instead they are owned and operated by business people who sell the electricity produced on the wind farm to electric utility companies.

Operating a wind power plant is not as simple as just building a windmill in a windy place. Wind plant owners must carefully plan where to locate their machines. One important thing to consider is how fast and how much the wind blows. As a rule, wind speed increases with height and over open areas with no *wind breaks.* Good sites for wind plants are the tops of smooth, rounded hills, open plains or shorelines and *mountain gaps* where the wind is funneled. The three biggest wind plants in California are located at mountain gaps.

Wind speed varies throughout the country. It also varies from season to season. In Tehachapi, California, the wind blows more during the summer than in the winter. This is because of the extreme heating of the Mojave desert during the summer months. The hot desert air rises and the cooler, denser air from the Pacific Ocean rushes through the Tehachapi mountain pass to take its place. In Montana, on the other hand, the wind blows more in the winter. Fortunately, these seasonal variations match the electricity demands of the different regions. In California, people use more electricity during the summer for air conditioning. In Montana, people use more electricity during the winter for heating.

How much energy do we get from wind?

Every year, wind energy produces enough electricity to serve about 300,000 households, as many as in a city the size of San Francisco or Washington, D.C. This is only a small amount of the electricity this country uses.

One reason wind plants don't produce more electricity is that they can only run when the wind is blowing 14 mph or more. In most places, the wind is only right for producing electricity about 25 percent of the time. But, wind machines are clean and they don't cause air or water pollution.

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